^{3}He A, B phase Superfluid density in Aerogel

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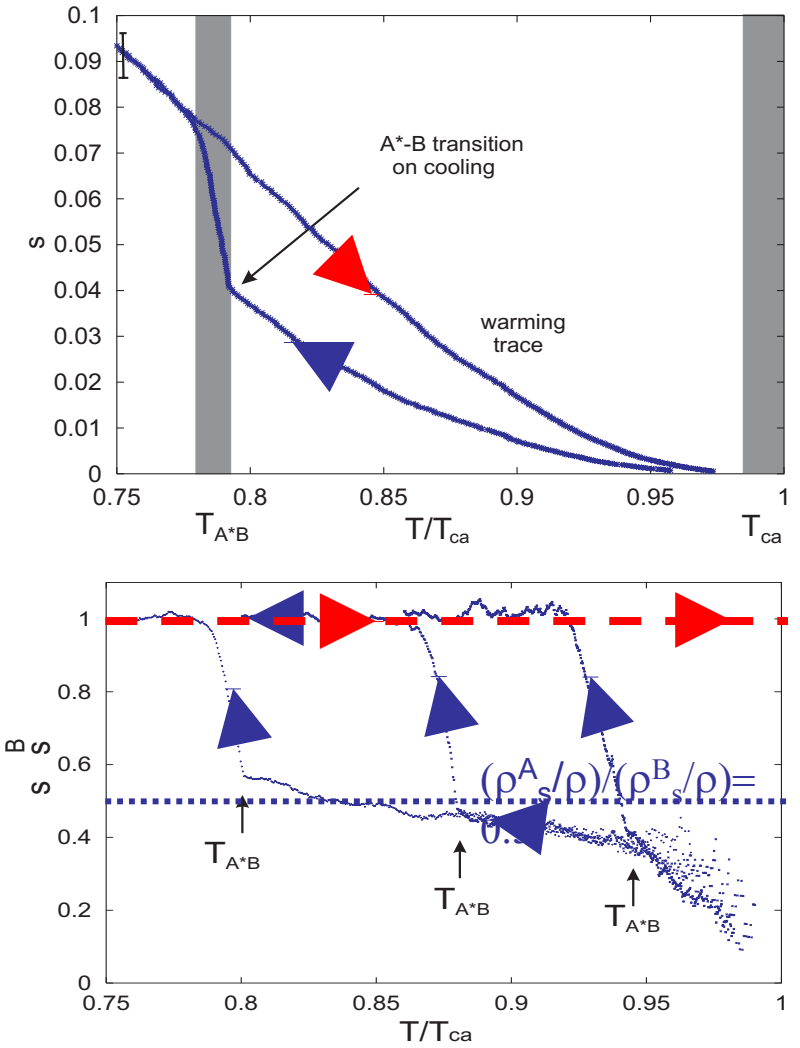
^{3}He is the purest system known. Silica aerogel, an ultra-light glass provides the means to add "correlated disorder" to the ^{3}He.

The superfluid state of disordered ^{3}He shows characteristics different from that of "clean" bulk ^{3}He. The onset and properties of the two zero field states (the A and B phases) is significantly different. We assay these phases by seeing how much fluid is in the superfluid state. The results imply that the disordered A phase is very different from the bulk A phase.



Top panel shows the superfluid fraction while cooling (A phase, blue arrow) and warming (B phase red arrow). The ratio at 3 pressures is shown in the lower panel.

Nazaretski, Mulders, Parpia JETP Lett. 79, 470 (2004)

Disordered ^{3}He A & B Phase superfluid density

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- Education

A post doc, Evgueni Nazaretski, led this work and is now a staff member at Los Alamos.

Andrew Fefferman, a first year Grad Student at Cornell is continuing this research.

Norbert Mulders is a Professor at the University of Delaware

- Societal Impact

The ability to understand the role of disorder on phase transitions is of importance in topics as diverse as metallurgy and biology.

Bulk ^{3}He is a system that has been proposed as an experimental laboratory for models of the formation of stellar matter. Adding disorder to the system may allow us to understand the analogy better.